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ABSTRACT

An information society is one in which the expression "to earn one's daily bread by the sweat of one's brow" appears decidedly anachronistic. People have been seduced by the rhetoric of novelty and confused by the surface significance of terms which have become accepted parts of everyday speech. What do rubrics such as information society, information age, post-industrial society, information economy, and micro millenium actually denote? Merely using such terms does not imply a clear understanding of the issue. Frequently used definitions are too broad and too elastic to be useful. Greater refinement is needed to differentiate between occupations informational in character and those which are simply information intensive. Toffler used a social wave front analysis technique to illustrate fundamental transformations in socio-economic functioning. Others, including Bell, provided a framework in which to analyze and comprehend macro-level changes in late industrial societies. The growing awareness that information behaves as an active economic resource has focused attention on occupational activity shifts within developed nations. Economists such as Machlup and Porat have highlighted the growing proportion of the labor force involved in the generation, processing, and distribution of information. Naisbitt corrected the popular misconception that job growth is the preserve of the high-tech, sunrise industries. In fact, only about 10 percent of the jobs created in the past ten years have been high-tech jobs. The subject is further clouded by the widespread difficulty of distinguishing between service and information industries. An information systems typology becomes necessary as the volume of information in circulation increases. An expanded typology might comprise the following systems: mission-based, discipline-specific, intelligence processing, repository/archival, corporate social utility/problem-solving, and homespun/personal. Collectively, these systems constitute the engine of information-based economies in which information possesses the features of a "hidden property good." Nevertheless, it may be more instructive to think of information as a social and economic lubricant: man cannot live on information alone. (BZ)

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Towards Information-Based Economics

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Third Annual Lazerow Memorial Lecture
School of Library and Information Science,
Indiana University

April 2, 1986

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Blaise Cronin

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His research interests include the following: information policy; the organizational and social impacts of information technology; the dynamics of innovation; information resource management; and, education and training for the information professions. Professor Cronin has published extensively. Recent books are: *The Transition Years* and *The Citation Process*. He is also editor of *Information Management: From Strategies to Action* and series editor of *Foundations of Information Science*, published by the IIS. His editorial board memberships include: *International Journal of Information Management* and *British Journal of Academic Librarianship*.

Professor Cronin is actively involved in professional affairs, nationally and internationally. His United Kingdom committee representations include: the British Council Libraries' Advisory Committee; Aslib Council; and the Education and Training Group of the Confederation of Information Communicating Industries (CICI). He is a member of the Market Research Society, the British Institute of Management, the Institute of Information Scientists and a Fellow of the Library Association.

Towards Information-Based Economies

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Prologue

It is a distinct honour and pleasure for me to have been invited by Dean White to deliver the 1986 Samuel Lazerow Memorial Lecture at Indiana University. It is a double honour for me in so far as I believe I am the first UK individual to whom such an invitation has been extended. Although I did not personally know Samuel Lazerow, I am well aware of his many contributions to the commercial development of ISI (the Institute for Scientific Information), an organization for which I have the greatest admiration. ISI was one of the pioneering members of the information industry and over the years has displayed a commendable commitment to growth, customer needs and product-line excellence. It, therefore, seems appropriate that the theme of my talk should be an overview of those trends which have led economists and others to speak in terms of information-based economies.

Introduction

Some months ago I delivered the keynote address at the annual conference of the British and Irish Computer Societies on the subject of 'The Information Society'. I would like to begin this paper by quoting a few lines from that address: 'An information society is one in which labour has been intellectualized; one in which the expression 'to earn one's daily bread by the sweat of one's brow' sounds decidedly anachronistic. Soon, terms such as information worker, knowledge engineer, ideas processor, symbol manipulator will be as common as weaver, cartwright and miller once were. The soi disant information society has come of age. What began life as a sociological construct

and then became a feature of futurologists' patois before degenerating into a media cliche has finally achieved respectability through endorsement by economic and political analysts . . . '.[1] Or has it?

Today I am less sure. To some extent I feel we have been seduced by the rhetoric of novelty; confused by the surface significance of terms which have become accepted parts of everyday speech. What do rubrics such as information society, information age, post-industrial society, information economy and micro millenium actually denote? What do they seek to describe? Let me quote a few lines from a recent paper by Martin: 'Does information society mean exactly what it implies, a society whose leitmotif is information? Or is it more appropriate to talk about an information-conscious society, in which people realize the importance of rapid access to information? Or, indeed, does the term have some basic economic connotation as an information economy or information sector?'[2]

I am not persuaded that all those who employ such terms have a clear understanding of what is implied, or have taken the trouble to analyse their operational significance. Martin goes on to say that 'the term has come to represent societies at an advanced post-industrial stage, characterized by a high degree of computerization, large volumes of electronic data transmission and an economic profile heavily influenced by the market and employment possibilities of Information Technology'. It is not difficult to accept this definition, but we need to go further if we are to arrive at a concrete understanding of the features associated with information-based economies. The inclusion of the word 'towards' in the title of this paper is a form of qualification. I would not dispute that in the last two decades developed economies have undergone major techno-structural change, but I think the onus is one people such as myself to demonstrate the connection between the labels and reality and to quantify the extent to which there has been structural change at both the macro and micro-economic levels.

Prophets of a New Age

From the vantage point of the mid-1980s it is possible, applying social wave front analysis techniques, to chart global shifts and displacements in economic activity over time. Toffler identified three rolling waves of change, corresponding to the agrarian, industrial and information revolutions.[3] Each of these successive, though necessarily overlapping, waves of change coincided with periods of fracture, discontinuity and novelty in social patterns, technological innovation and economic activity. The history of economic man is, of course,

considerably more complex than Toffler's three-wave analysis might suggest, but the technique has at least the virtue of throwing into relief fundamental transformations in socio-economic functioning.

Others, notably Bell in his scholarly 'The coming of post-industrial society: a venture in social forecasting'[4], provided a sociological framework in which to analyse and comprehend macro-level changes in late industrial societies. The growing awareness that information behaves as an active economic resource, like capital, plant or human resources, has focussed attention on shifts in occupational activity within developed nations. Economists, such as Machlup[5] and Porat[6] in their seminal analyses of the US economy, highlighted the growing proportion of the labour force actively and centrally involved in the generation, processing and distribution of information.

It is the case that if something is repeated sufficiently often it will eventually be accepted as true. So it is with statistics relating to the information worker population. Few, it would seem, today question the validity of statements to the effect that 50% + of the US labour force is engaged in information work. In a sense, the recent decision by the US Bureau of Labor to replace the term 'white collar worker' with 'information worker' can be seen as the final legitimation of the statisticians' oft-cited claims. Strassmann, in his book 'Information payoff: the transformation of work in the electronic age', provides us with an impressive set of figures. He estimates that more than 63% of all equivalent working days in the US economy in 1982 was devoted to information work; that the average weekly workhours expended by information workers is 10%-20% greater than for other occupational categories; that information workhours account for 70% of the total recorded, and that at least 67% of all labour costs are consumed in respect of information work.[7]

Similar, though not quite so striking, statistics are to be found for many other countries—e.g. the UK, Venezuela, Australia and the Republic of Ireland. Recently the Technical Change Centre forecast that if growth in the information industries sector of the economy were to continue at the rate it did for the period 1961-1979, this sector would account for more than 45% of all jobs by the year 2000.[8] Real occupational growth in the UK would appear to be confined to both information occupations and non-information occupations within the broadly defined information sector.

This picture may, however, change and may not in any case apply universally. In 'The year ahead' Naisbitt corrects a popular misconception that job growth is the preserve of the high-tech, sunrise industries: ' . . . only about 10% of the jobs created in the last 10 years have been high-tech jobs. Most are 'low-tech' or 'no-tech' . . . practically all are entrepreneurial and innovative busi-

nesses. . . . Whilst it is true that the number of jobs being created currently is weighted on the no-skill, low-pay side, there is evidence that many service jobs are being 'upgraded' by the nature of the tasks being performed'.[9] This should act as a caution against attributing all new job creation to the emergent information economy.

Focus and Definition

The fact that fewer people now work in agriculture, the construction, mining and manufacturing industries does not mean that the contribution of these industries to GDP (Gross Domestic Product) has declined. Manpower reductions are achieved through higher levels of capitalization, which result in improved worker productivity. Output levels are maintained or improved through the intelligent application of new technologies, production methods and labour-saving schemes. The relationship between capital investment and productivity is revealing. In the US, between the years 1953 and 1979, manufacturing productivity rose by 126%, farm worker productivity by 162% and white collar worker productivity by 112%. The respective levels of capital investment were: $30,000, $70,000 and $2,000 per worker.[10] I leave you to draw your own conclusions.

As the number of workers in the primary (agriculture and extractive industries) and secondary (manufacturing industry) sectors of the economy has fallen dramatically (see for example, Porat's four-sector analysis of the US workforce,[11] or Jones'[12] analysis of the Australian economy), there has been commensurate growth in the number of workers in the tertiary sector (service industries, e.g. banking, health care, leisure) and also in the so-called quaternary (information and knowledge) industries.

As I have already suggested, few people would quibble that there has been, and continues to be, significant change in terms of the level and composition of national economic activity, but there remains the problem of achieving consensus in micro-level interpretation. The work of Porat constitutes a landmark study in re-evaluative economics, but has left uncertainties in its wake. His classification of information worker occupations is, in itself, reasonable. The four principal categories are: information workers (who create new information or package existing information into more appropriate forms); information processors (who receive and respond to information inputs as the basis for further operations; information distributors (who convey information from the initiator to the recipient), and the information infrastructure (those responsible for the installation, operation and repair of machines and technologies used to support information activities).

The difficulty comes at the level of individual occupation classification. Are teachers, postal workers, lawyers etc. information workers? The answer, not surprisingly, depends on how one chooses to define information work. In some respects, this approach to taxonomy is not unlike changing the label on a bottle of wine without changing the content. A label change does not make a 1986 Beaujolais a 1945 Chateau Lafite. The problem is not, however, just one of classification, but lack of standardization between existing classification schemes. The variability in criteria employed makes it virtually impossible to collocate meaningful cross-national statistics on developments in the information sector of the economy or monitor shifts in activity from year to year.

A Change of Focus

It seems to me that the definitions in vogue are too broad, too elastic to be useful—other than at the most superficial level. Greater refinement is needed to differentiate between occupations which are primarily informational in character and those which are simply information-intensive in nature. Teachers, lawyers and others do routinely create and use information, but such activity is scarcely the raison d'etre of their professional lives, nor, one might add, is it something they have only recently begun to do. Many such occupational groups are doing what they have always done. Their role perceptions have probably not altered one iota; what has altered is the taxonomic perspective favoured by economic analysts.

The subject is further clouded by the widespread difficulty of distinguishing between service and information industries. Disaggregation inevitably becomes a matter of personal preference rather than objective assessment. As Martin observed: 'many of the goods and services being classed within the information sector are in fact only informational at one or two removes'.[13]

A partial solution may be to narrow the focus. In 1983, the Information Technology Advisory Panel of the Cabinet Office published a short, but influential, report entitled 'Making a business of information: a survey of new opportunities'.[14] The overall aim of the report was to turn the spotlight of public attention from information technology to information. The report introduced the term 'tradeable information sector' into the vernacular. Its attention was directed to the 'developing market for information in many different forms'. The authors conceded the difficulty of trying to assess the current economic importance of the tradeable information sector, but estimated that approximately one million people in the UK were employed in

tradeable information activities and that this sector accounted for roughly 5% of GDP (7.5% at 1985/86 estimates). In employment terms it is thus comparable with the construction industry, or three times as large as agriculture, forestry and fishing.

As far as the UK is concerned, this sector is likely to be of increasing economic importance in the years ahead. Between 1971 and 1980, Britain's balance of trade surplus in this area rose from $0.5 to $2.4 billion, which no doubt is one reason why national governments are so keen to raise information awareness, willing to subsidize infrastructural developments in telematics and prepared to make pump-priming funds available to service providers and manufacturers in the private sector—sometimes with less than totally balanced judgement or tangible pay-backs.

The tradeable information sector labour force is, presumably, a sub-set of the universe identified by Porat et al, but it has the attraction of being both more tightly defined and occupationally homogeneous. Its members are primarily engaged in core information processing activities, operate in a more or less clearly defined information marketplace (increasingly international in character) and concerned with the development and marketing of added-value information services and products for ever-more sophisticated and demanding market segments. But, we are still talking about a fairly small proportion of the total labour force.

Beyond Generics

Information worker is a generic appellation of limited utility. The spectrum it defines is extremely broad and highly differentiated. As a consequence, groups located on the spectrum often appear to have very few shared features. The lowest common denominator is some (loosely articulated) interest in or involvement with aspects of information handling or distribution. This realization, I suspect, was one of the reasons for the funding some years ago of the King/Debons study of the information profession, a study which attempted to go beyond the generalities of Porat et al and identify an occupational nucleus whose primary activities/experiences were centrally related to the manipulation and processing of information qua information. This study concluded that the core information professional population in the US was of the order of 1.6 million (+ or − 10%)—a far cry from the credibility-stretching figures of Porat and others.[15]

In an attempt to demonstrate that the much vaunted information society is more than a sociological construct, we have sometimes pushed our claims too far with the effect of weakening the underlying

case. To some extent we have tended to take increased information use and awareness as evidence of large-scale macro-level economic restructuring and attempted to rewrite industrial/occupational classification schemes on that basis. But the growing information consciousness which characterizes contemporary developed societies is not in itself sufficient or necessary reason to infer substantive change in the nature of occupational activity—at least not on the scale some commentators would have us believe.

To take an obvious illustration: is the airline business a service or an information industry—or has it features of both? The world's major carriers have for years been at the forefront of developments in high-volume, real-time data transmission and processing. The industry executes some 5-7 billion online transactions per year, and depends wholly on the efficacy of its computer systems for up-to-the minute operational and management information. Without substantial investment in information and communications technologies the industry could not have maintained its remarkable growth rates over the last two decades. But is it an information industry or an information-intensive service industry?

American Express, to take another example, is also a high volume user of data transmission networks—350 million transactions per year. Its operational success is inextricably linked to its ability to exploit state-of-the-art communications facilities. But is it an information or financial services industry? Banks, too, are investing heavily in computer and telecommunications systems and generate some 3 million electronic data transmissions per working day. Are they information or financial services institutions? The world's money markets and stock exchanges are very much leading-edge users of sophisticated systems for processing dynamic, real-time financial information. Companies such as Reuters, Dow Jones and Telerate generate enormous after-tax profits providing global investors and speculators with up-to-the-second information on commodity prices, exchange rates and company performance. But are investment analysts and commodity brokers information workers or financial experts?

The Information Explosion

To understand why this confusion in interpretation has come about it is necessary to consider just what is meant by the phrase information explosion. In the 1950s and early 1960s the late de Solla Price attempted to quantify the growth of scientific output and activity. In two important monographs, 'Science since Babylon'[16] and 'Little science, big science',[17] he exposed the exponential growth of scientific

output from the mid-17th to mid-20th century. He noted a constant doubling in the population of scientists and their published output. He further concluded that by about 1850 the 'process had reached a point of absurdity: no scientist could read all published work that might be relevant to his interest'. According to de Solla Price, 'Big science' suffered from a pathological 'superabundance of literature'.

The growth in institutional science, the size of the tertiary education population and levels of government-funded R & D all fueled the information explosion. In an attempt to control and optimize the utility of this mass of public domain output, the information profession developed new and improved means of information handling and dissemination. During the 1960s and 1970s major advances were made in the field of computerized information retrieval and dissemination, and the foundations were laid for the development of what we today refer to as the online or electronic information industry.

It was Bell, I believe, who spoke of a reciprocal relation between the expansion of science, the hitching of that science to a new technology and a growing demand for news, information and instrumental knowledge.[18] The application of data processing techniques, and, more recently, microprocessor-based technologies to the problems of information transfer, provided a partial relief to the pathology diagnosed by de Solla Price.

The problem, however, is not simply that of over-production of scientific information. As society becomes more complex, sophisticated and bureaucratized, the volume of information (legal, regulatory, social, consumer, environmental, etc.) in circulation increases correlatively. Innovation, decision-making, administration and social functioning have all become increasingly information-dependent. Today, information has become the sine qua non of successful social and organizational performance. The volume and complexity of information continues to grow; the labour costs associated with information management rise year-by-year; the time available to managers and policy makers for decision-taking is contracting; the criticality of information to the maintenance of competitive edge is widely recognized, and the value of information as a tradeable commodity no longer questioned. To respond to these problems and challenges developed nations have begun to invest heavily in the new information handling technologies.

Technology itself does not provide answers, only the means to better address the issues involved. The ingestion of information technology can be a painful and not always rewarding experience. Technology is not a panacea. The attraction of cheap processing power is obvious, but unless information systems are intelligently introduced

and carefully grafted onto the organizational torso, the return on investment may be negligible. Strassmann has found that there is not a straightforward positive relationship between levels of organizational investment in information technology and management added value.[19] More, in other words, does not necessarily mean better. In his view, information technology can just as easily amplify bad as good management.

Information Systems Typology

There is a temptation to see the computer industry as the backbone of the information society. Its products are tangible, highly visible and pervasive, and its global revenues can be calculated in billions of dollars. But technology alone, as Cherry observed, is 'dead metal'.[20] An information society is one in which the use of information is central to social development and organizational management. Strictly speaking, the absence or presence of a high degree of automation is not the determining criterion, though in practice there tends to be a strong positive correlation between the amount of information in use and the degree of technology penetration. The computer revolution has both helped us manage the proliferation of recorded information and exacerbated the problem of over-supply. Technology is, in effect, a twin-edged sword, which spawns problems as it proffers solutions.

Statistics relating to the shipment and installation of computers are not in themselves particularly useful indicators of the extent to which a country is shifting from a manufacturing or service industry base to an information-based economy. Investment in flexible manufacturing and computer-aided design systems, for instance, is hardly reason to suppose that a change in economic emphasis is under way. We need, instead, to look at developments relating to information systems and services (public and proprietary; subsidized and fee-based), as these will give an insight into market demand and consumption levels.

In a report ('Into the information age') commissioned by the American Library Association, Giuliano posited three overlapping information eras and contests.[21] Era I systems are discipline-based, traditional in character, derive from the 19th century and take the form of research libraries and journal complexes. Era II systems emerged during World War II, are linked to the growth of 'Big science', associated with large-scale interdisciplinary projects (such as putting a man on the moon) and heralded the advent of mechanized documentation systems. Era III systems are a 1960s and 1970s phe-

nomenon and place the emphasis on solving socio-technical problems (e.g. improving the quality of life). This is a useful, but perhaps over-simple typology. An information-based economy will comprise a much wider range of generic/sectoral systems, reflecting the complexity of life in a post-industrial society.

An Expanded Systems Typology

An expanded typology might comprise, inter alia, the following systems: mission-based; discipline-specific; intelligence processing; repository/archival; corporate; social utility/problem-solving; homespun/personal. For this paper I am using the term information system in a very broad sense to include conventional library and information units, networks, information producers and suppliers, host organizations, brokerage companies, advice and referral agencies, database spinners, electronic publishers and allied concerns. Let consider each of these in turn.

Mission-based systems tend to be innovative (in terms of design and operation), interdisciplinary, relatively costly and large-scale in character. They occasionally deal with classified information (e.g. defense or energy-related), serve R & D populations and are designed to assist in the creation of new knowledge. Funding, by and large, comes from government departments and agencies.

Discipline-specific systems, as the term implies, are designed to assist research and scholarship in a specific subject field or sub-field. They are 'open' systems dealing with public domain knowledge and responsible for its dissemination to the appropriate end-user population(s). They can vary greatly in terms of scale and sophistication, are often fairly traditional in character and deal primarily with bibliographic information, though the creation and exploitation of full-text retrieval systems is on the increase.

Intelligence processing systems deal with information relating to military matters, national security issues, the maintenance of law and order and (in the private sector) credit worthiness and competitor performance. They tend to be highly computerized, very state-of-the-art and deal with extremely sensitive or proprietary information. Public concern is often expressed about the scope for misuse or abuse of the information held in such systems.

Financial systems (as distinct from in-house accounting systems) deal with highly volatile, global information in a real-time mode. They are customized in character and 'highly niched': they serve the needs of a small but highly specialized and resource-rich market—financial analysts, brokers etc. Capital and operating costs associated with such

systems are considerable, but the pay-offs can be great. Such systems tend to be end-user operated and deal with information which is not always readily available to the public (or if it is, only on payment of a hefty fee).

Corporate systems have traditionally been mainframe-based, but there has been a perceptible shift to distributed processing and devolved decision-making. They provide management information relating to inventory levels, cash-flow, market trends etc. and enable companies to handle routine, labour-intensive transactional processing requirements more efficiently and economically. In recent years there has been a trend to develop corporate information management systems and to provide middle and senior managers with improved decision-support software. Expert systems and ideas processing software will progressively provide the apex of the organizational hierarchy with a new set of tools to improve managerial effectiveness.

Social utility/problem-solving systems are often low-budget, non-computerized and local in character. Inter-agency cooperation and collaboration may be a feature. Their foci are environmental problems, literacy and ethnic issues, legal and welfare rights, consumer protection, education and health. Most such systems, whether high-tech or low-tech in character, are publicly funded and their use often subsidized. As a rule they are intermediary-managed, though importance is attached to developing user-cordial systems which will accept natural language input in response to menu-driven prompts. In the medium-term future some such systems will incorporate diagnostic software to allow for non-mediated user/system interaction on complex or highly personal matters.

Repository/archival systems are largely synonymous with libraries (especially those in the public sector), public record offices and archives. These institutions are arguably underfunded and make variable use of the new information technologies. With exceptions, this group is not noted for its innovativeness, but has, however, a strong service orientation. Although some such systems are vulnerable to technological bypass, they have, collectively, a key role to play in preserving a 'cultural audit trail' for society. Although there is a strong argument for improving their revenue-generating capability and for encouraging inter-sectoral cooperation, it would be naive to expect such systems to become wholly self-financing.

Grey systems are often to be found in the academic community, though they are by no means unheard of in the corporate world. Their existence may be known to only a handful of initiates and their use restricted to an individual, a carefully vetted closed-user group or electronic invisible college. They primarily serve the needs of a local

community, but may well be of interest and value to a much wider constituency. As a general rule, there is a strong case for improving awareness of such systems, of interconnecting cognate systems, and, perhaps, on occasion floating them as public utilities. End-user design and use is the norm with grey systems and they tend not to be created with commercial opportunity in mind. Duplication of design and development effort is a common feature.

Homespun/personal systems are one level down from grey systems. By definition they are hobbyist in nature, personalized in character and content and may have limited extra-domestic appeal. However, it is conceivable that an electronic cottage industry could develop, with files being exchanged, blended and refined for ultimate commercial application.

Collectively, these systems (viewed as operational entities rather than an aggregate of inert hardware) constitute the engine of information-based economies. It is they which create the conditions, products and services from which the existence of an information industry can be inferred. The status of information systems development (across the typology adumbrated above) is arguably a more useful and meaningful indicator of 'post-industriality' than arbitrarily assigned occupational classifications. Concrete measures can at least be invoked, e.g. number and size of systems; committed investment; associated capital and labour costs; substitution/replacement costs; revenues; contribution to GDP and balance of trade; customer/user base size; derived benefits etc.

Alongside these quantitative measures of informational activity within the economy, it should be possible to assemble qualitative measures relating to information awareness/consciousness at the national level. In very general terms it is fair to say that some countries (e.g. France, Japan and the U.S.) are more sensitized to the importance of information than others. This can reveal itself in a variety of ways.

Since the publication of the Nora report, 'L'informatisation de la societe',[22] successive French governments have made a considerable commitment to the creation of a national telematic infrastructure. A vast amount of public money has been made available to set in place the foundations for a genuinely electronic information society and to provide France with a strategic advantage over many of its competitor economies. The driving force behind developments in France (in contradistinction to, say, the U.S.) is not consumerism, but social and political priorities—an approach which has been described as 'national technological reconstruction through public-sector stimulus'.[23]

The situation in Japan is analogous, though here the emphasis has been on fusing effective and imaginative relationships between

the public and private sectors in the belief that collaboration will be mutually beneficial. The success of the Japanese economy depends greatly on its remarkable export performance. To sustain this, the public and private sectors need an unusually high degree of trust in order to facilitate successful, large-scale strategic research and development programmes, without which the momentum for economic growth could not be sustained.

In Britain and the U.S. a much more laissez-faire situation obtains, with, in general, market forces propelling developments in the information industry sector. In neither Britain nor the U.S. is there anything similar to the national telematic programmes of France and Japan. However, the respective governments do attempt to stimulate the market through occasional subsidy and to raise information awareness through promotional campaigns. The U.K. government, for example, sponsored a very successful information Technology year in 1982 and followed this with a variety of consciousness-raising campaigns such as the Microelectronics Education Programme.

Other obvious indicators of growing national information awareness are the large number of conferences, symposia, exhibitions and publications dealing with the information industry, information skills, and information technology products and applications. Another indicator is the number of job advertisements for individuals with knowledge of information systems and services, in particular people capable of creating new (added-value) services and products for a rapidly expanding and discriminating market.

The Information Good

It is not only national governments which have become interested in the economic significance of information. The business community has, likewise, woken up to the fact that information behaves as an active economic resource and as such requires new and improved techniques for its effective management. Today, information is routinely spoken of as a commodity or resource, but it is a commodity or good with unusual attributes, some of which I should like now to enumerate.

With information there can sometimes be problems relating to ownership, which cannot always be solved by invoking copyright law or turning to citation indexes. Information also has properties referred to by economists as 'public good externalities': that is to say, the benefits derivable from a particular quantum of information can be widely enjoyed and additional consumers satisfied at zero cost (non-exclusivity in consumption).

In the information exchange process there may often be uncertainty as to the ultimate value, utility or reliability of a particular quantum or parcel of information. In a sense, information has the features of a 'hidden property good'. Unlike conventional commodities, information does not deplete on use: it is inexhaustible, and more for A does not necessarily mean less for B. However, information also has the features of a saturation good, which is simply to say that demand can be satisfied once and for all (in a way that hunger cannot).

Whereas some goods (fine claret, for example) can appreciate with age, the value of information can depreciate over time (the short-half life of much contemporary scientific literature is a case in point). Another difference between most commodities and information relates to price fluctuations. The price of most commodities tends to fall within a predictable range; the same cannot really be said of information.

Another characteristic of the information good is that of pecuniary externalities. The addition of a new quantum of information to the existing knowledge stock can upwardly revalue that stock in a way which may not have been expected. Information is also an unusual commodity in terms of its life cycle: information can have multiple life cycles, as ideas come into, move out of and finally come back into fashion.

Two final points: (i) demand for information (unlike, say, demand for bread) can be extremely variable, which may make forward planning and information marketing a sometimes difficult exercise; and (ii) information is a resource which in effect conserves other resources (e.g. labour), and which contributes to increased yield by improving decisions concerning their (i.e. other resources') use and mix.

Envoi

Even before de Solla Price quantified the growth in scientific publishing and Porat the expansion of the information workforce, many interested observers sensed that developed nations were moving to an information-dependent mode of economic functioning. The statistics assembled by writers like de Solla Price and Porat confirmed our 'gut reactions' and helped galvanize interest within and outside the academic community in information-related issues and policy.

In analysing and dissecting occupational roles it is obvious that a considerable number of people spend a considerable slice of their working lives handling information—in one way or another. In many late 20th century jobs there is little or no tangible end-product or

output. Activity is essentially cerebral, though not always high level. More often than not, inputs and outputs are 'soft'. Just as it is reasonable to view organizations as information processing entities, so, arguably, is it reasonable to see present-day society as a scaled-up information processing organism.

The welter of information statistics, indicators and growth curves currently available testify to the fact that developed economies are undergoing change of an unprecedented kind. On that point there is relatively little dissension. Differences of opinion arise in relation to interpretations of scale and rate of change, and the legitimacy of some of the classification tools being used to cluster occupations as information or non-information in character.

Information can be described as a commodity or good, but it may be more instructive to think of information as a social and economic lubricant. Information is a resource which conserves other resources: one which facilitates, integrates and enables. To overuse terms such as commodity is to run the risk of reification and to confuse an issue which is already in need of explication. The contribution of information to successful economic functioning is beyond question, but that is not quite the same as saying that information has become the primary output of developed economies. We are moving towards information-based economies, but are a long way from being wholly dependent on the production, sale and exportation of information goods and services for the preservation of our economic well-being. After all, if I may paraphrase, man cannot live on information alone.

Notes

1. Cronin, B. The information society. Keynote paper presented at Interact 85, Annual Conference of the British & Irish Computer Societies, Newcastle, November 1985.
2. Martin, W.J. Some thoughts on the information economy. Paper presented at the IRFIS Conference, Frascati, September 1985.
3. Toffler, A. The third wave. Pan, 1981.
4. Bell, D. The coming of post-industrial society: a venture in social forecasting. Basic Books, 1973.
5. Machlup, F. The production and distribution of knowledge in the United States. Princeton University Press, 1962.
6. Porat, M.U. The information economy: definition and measurement. US Department of Commerce, 1977.
7. Strassmann, P.A. Information payoff: the transformation of work in the electronic age. Collier Macmillan, 1985.
8. Gleave, D. et al. The impact of new technology on the labour market and demands for information services. Technical Change Centre, 1985.
9. Naisbitt, J. The years ahead. American Management Association, 1985.
10. Kalthoff, R.J. and Lee, L.S. Productivity and records automation, Prentice Hall, 1981.
11. Porat, M.U., op.cit.
12. Jones, B. Sleepers, wake! Technology and the future of work. Oxford University Press, 1982.
13. Martin, W.J., op.cit.
14. Information Technology Advisory Panel. Making a business of information: a survey of new opportunities. Cabinet Office, 1983.
15. Debons, A. et al. The information professional: survey of an emerging field. Dekker, 1981.
16. Price, D.J. de Solla. Science since Babylon. Yale University Press, 1961.
17. Price, D.J. de Solla. Little science, big science. Columbia University Press, 1963.
18. Bell, D., op.cit.
19. Strassmann, P.A., op.cit.
20. Cherry, C. World communication: a threat or promise? Wiley, 1978.
21. Giuliano, V. et al. Into the information age: a perspective for federal action on information. American Library Association, 1978.
22. Nora, S. and Minc, A. The computerization of society. MIT Press, 1981.
23. Barr, T. The electronic estate: new communications media and Australia. Penguin, 1985.

Samuel Lazerow

Samuel Lazerow, in whose honor and memory these lecture series have been established, had a record of long and distinguished service in the library profession. An honors graduate of Johns Hopkins University who received his library graduate education at Columbia, he then returned to his home city of Baltimore to work at the Enoch Pratt Free Library. During World War II he served as the Army's chief library officer in Europe. Starting in 1947, Mr. Lazerow then spent 25 years of service in the federal library community, and held administrative posts at each of the three national libraries. From 1947 to 1952 he served as chief of acquisitions at the National Library of Agriculture, and followed that with a similar assignment at the National Library of Medicine from 1952 to 1965. In that year he joined the Library of Congress, where he headed a task force on the automation and sharing of services between the national libraries.

He joined the Institute for Scientific Information after his retirement from government service, and held the post of vice president for administration from 1972 until his death. This series of lectures was initiated by Dr. Eugene Garfield, founder and president of ISI, as a tribute to his friend and colleague. The Indiana University School of Library and Information Science is proud to have been selected as one of four schools to participate in the recognition of this library leader.

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